

Computer Science 317  
Introduction to Artificial Intelligence  
MidTerm Examination  
October 31, 2007

Time: 50 Minutes  
Total marks: 50

Answer any 10 (ten) of the following questions. Each question is worth 5 marks. You may use “point form” in your answers.

1. What are the four criteria for measuring the performance of a search technique? Explain each one very briefly.
2. Suppose you heard someone claim “Breadth-first search should never be used.” Would you agree, or disagree? Explain, with reference to the criteria from the previous question.
3. What are the advantages of iterative deepening search over depth-first search? What are the disadvantages?
4. In the context of search using  $A^*$ , what is an *admissible* heuristic? Why is an *admissible* heuristic important in  $A^*$  search?
5. In some search problems, such as Assignment 2, simple heuristic estimates  $h$  might be much smaller than the true cost of getting to the goal. Explain the problem this causes for  $A^*$  search.
6. What are the components of a constraint satisfaction problem? (In other words, describe how CSPs are specified) Why is depth-first search *complete* for constraint satisfaction problems?
7. We studied forward-checking and arc consistency, for use in solving constraint satisfaction problems. Explain what their purpose is, and explain briefly what the difference is between these two techniques. (You don’t need to explain in detail how they work.)
8. Explain the difference between hill-climbing search (also known as gradient ascent/descent) and simulated annealing. Explain why simulated annealing is usually able to find a better answer to a given problem.
9. Give a small example of a situation in which Alpha-Beta search can avoid some of the work that Minimax must do. (You can answer by drawing part of a game tree, and giving values that demonstrate the savings. Also include a brief description of the example.)
10. In logic, we have the terms “entailment” and “inference”. Give a definition for both terms that demonstrates the difference between these concepts.
11. Give an example of the use of the resolution inference rule for propositional logic (in CNF). Give an example of the use of the Modus Ponens inference rule (for Horn form). Show that one of these two is a special case of the other.